ALASKA POLLUTANT DISCHARGE ELIMINATION SYSTEM

PERMIT FACT SHEET – PRELIMINARY DRAFT

Individual Permit: AK0029840 – BP Exploration (Alaska), Prudhoe Bay Seawater Treatment Plant

DEPARTMENT OF ENVIRONMENTAL CONSERVATION

Wastewater Discharge Authorization Program

555 Cordova Street

Anchorage, AK 99501

Public Comment Period Start Date: [insert date]
Public Comment Period Expiration Date: [insert date]
Alaska Online Public Notice System

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Proposed issuance of an Alaska Pollutant Discharge Elimination System (APDES) permit to:

BP EXPLORATION (ALASKA), INC.

For wastewater discharges from:

Prudhoe Bay Seawater Treatment Plant
Stefansson Sound
Beaufort Sea

The Alaska Department of Environmental Conservation (Department or DEC) proposes to reissue APDES individual Permit AK0029840 – BP Exploration (Alaska), Prudhoe Bay Seawater Treatment Plant (Permit). The Permit authorizes and sets conditions on the discharge of pollutants from this facility to waters of the United States. In order to ensure protection of water quality and human health, the Permit places limits on the types and amounts of pollutants that can be discharged from the facility and outlines best management practices to which the facility must adhere.

This fact sheet explains the nature of potential discharges from the Prudhoe Bay Seawater Treatment Plant and the development of the Permit including:

- information on public comment, public hearing, and appeal procedures,
- a listing of proposed effluent limitations and other conditions,
- technical material supporting the conditions in the permit, and
- proposed monitoring requirements in the permit

Public Comment

Persons wishing to comment on the Draft Permit may do so in writing by the expiration date of the public comment period. In addition, commenters may provide oral comments by attending a public hearing, if scheduled, as well as providing written comments. Written comments should be submitted to the Department at the technical contact address, fax, or email identified above (see also the public comments section of the attached public notice). Mailed comments and requests must be postmarked on or before the expiration date of the public comment period. Commenters are requested to submit a concise statement on the permit condition(s) and the relevant facts upon which the comments are based. Commenters are encouraged to cite specific permit requirements or conditions in their submittals

The Department will hold a public hearing whenever the Department finds, on the basis of requests, a significant degree of public interest in a Draft Permit. The Department may also hold a public hearing if a hearing might clarify one or more issues involved in a permit decision. A public hearing will be held at the closest practicable location to the site of the operation. If the Department holds a public hearing, the Director will appoint a designee to preside at the hearing. A hearing will be tape recorded. The public should also submit written testimony in lieu of, or in addition to, providing oral testimony at the hearing.

After the close of the public comment period and after a public hearing, if applicable, the Department will review the comments received on the Draft Permit. The Department will respond to the comments received in a Response to Comments document that will be made available to the public. If no substantive comments are received, the tentative conditions in the Draft Permit will become the proposed Final Permit.

The proposed Final Permit will be made publicly available for a five-day applicant review. The applicant may waive this review period. After the close of the proposed Final Permit review period, the Department will make a final decision regarding permit issuance. A Final Permit will become effective 30 days after the Department's decision, in accordance with the state's appeals process at 18 AAC 15.185.

The Department will transmit the Final Permit, Fact Sheet (amended as appropriate), and the Response to Comments to anyone who provided comments during the public comment period or who requested to be notified of the Department's final decision.

Appeals Process

The Department has both an informal review process and a formal administrative appeal process for final APDES permit decisions. An informal review request must be delivered within 15 days after receiving the Department's decision to the Director of the Division of Water at the following address:

Director, Division of Water

Alaska Department of Environmental Conservation
410 Willoughby Street, Suite 303
Juneau AK, 99811-1800

Interested persons can review 18 AAC 15.185 for the procedures and substantive requirements regarding a request for an informal DEC review.

See http://www.dec.state.ak.us/commish/InformalReviews.htm for information regarding informal reviews of DEC decisions.

An adjudicatory hearing request must be delivered to the Commissioner of the Department within 30 days of the permit decision or a decision issued under the informal review process. An adjudicatory hearing will be conducted by an administrative law judge in the Office of Administrative Hearings within the Department of Administration. A written request for an adjudicatory hearing shall be delivered to the Commissioner at the following address:

Commissioner

Alaska Department of Environmental Conservation
410 Willoughby Street, Suite 303
Juneau AK, 99811-1800

Interested persons can review 18 AAC 15.200 for the procedures and substantive requirements regarding a request for an adjudicatory hearing. See http://www.dec.state.ak.us/commish/ReviewGuidance.htm for information regarding appeals of DEC decisions.

Documents are Available

The permit, fact sheet, application, and related documents can be obtained by visiting or contacting DEC between 8:00 a.m. and 4:30 p.m. Monday through Friday at the addresses below. The permit, fact sheet, application, and other information are located on the Department's Wastewater Discharge Authorization Program website: http://www.dec.state.ak.us/water/wwdp/index.htm .

Alaska Department of Environmental Conservation
Division of Water
Wastewater Discharge Authorization Program
555 Cordova Street
Anchorage, AK 99501
(907) 269-6285

Alaska Department of Environmental Conservation
Division of Water
Wastewater Discharge Authorization Program
610 Fairbanks, AK 99709
(907) 451-2100

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1.0 INTRODUCTION

On September 3, 2015, the Alaska Department of Environmental Conservation (DEC or Department) received an Alaska Pollutant Discharge Elimination System (APDES) individual permit and mixing zone application from BP Exploration Alaska Inc. (BPXA or permittee) for reissuance of AK0029840 – BPXA, Prudhoe Bay Seawater Treatment Plant (Permit). Information contained in this fact sheet is based on information in both applications. The Permit and mixing zone applications include a request for the Department to develop an APDES individual permit to continue the authorization of discharges to Stefansson Sound, Beaufort Sea, from the BPXA Prudhoe Bay Seawater Treatment Plant (STP or facility), located on the North Slope on the shore of Stefansson Sound, Beaufort Sea (See APPENDIX A. FIGURES - A.1).

1.1 Applicant

This fact sheet provides information on the APDES permit for the following entity:

Name of Facility:	Prudhoe Bay STP
APDES Permit Number:	AK0029840
Facility Location:	Stefansson Sound, Beaufort Sea, Alaska
Mailing Address:	BP Exploration (Alaska) Inc. 900 East Benson Boulevard Anchorage, Alaska 99519-6612
Facility Contact:	Ms. Natalia Lau

The Permit authorizes the following discharges:

Outfall	Description	Receiving Water	Latitude	Longitude
001	Strainer Backwash	Stefansson Sound	70.416512	-148.528981

See APPENDIX A. FIGURES – A.1, A.2, and A.3 for the location of the facilities and discharges.

1.2 Authority

The APDES Program regulates the discharge of wastewater to waters of the United States (U.S.) in Alaska. Transfer of the National Pollutant Discharge Elimination System (NPDES) Program to Alaska occurred in four phases with oil and gas facilities transferring as part of the fourth and final phase on October 31, 2012. The state NPDES program is known as the APDES Program and is administered by DEC. Accordingly, DEC is now the permitting authority for regulating the discharges associated with the Permit and is reissuing the Permit for the first time post program transfer.

Section 301(a) of the Clean Water Act (CWA) and Alaska Administrative Code (AAC) 18 AAC 83.015 provide that the discharge of pollutants to water of the U.S. is unlawful except in accordance with an APDES permit. The individual permit reissuance is being developed per 18 AAC 83. A violation of a condition contained in the permit constitutes a violation of the CWA and subjects the permittee of the facility with the permitted discharge to the penalties specified in Alaska Statutes (AS) 46.03.020(13).

1.3 Permit History

The first NPDES permit for the discharges from the facility was issued by EPA to Atlantic Richfield Company (ARCO) on December 1980 and became effective in January 1981. The Permit was subsequently reissued to ARCO in October 1986, December 1992, and March 2000; the Permit was transferred to BPXA on July 1, 2000. The Permit was subsequently reissued to BPXA on November 29, 2004 and March 1, 2011 (existing Permit). On September 3, 2015 BPXA submitted a timely and complete application to DEC for reissuance of the existing Permit and the Permit was administratively extended prior to expiration on February 29, 2016.

Earlier permits through the 2004 timeframe included discharges from the marine life return system (MLRS) and treated domestic effluent wastewater. The MLRS was decommissioned after studies showed no negative impact to biological organisms. Previously issued permits covered discharges from a multi-media filtration system that underwent periodic backwashing that included the use of biocides (sodium hypochlorite and glutaraldehyde compounds). By the issuance of the existing Permit, the multi-media filtration system had been decommissioned and treated domestic wastewater was rerouted to the Seawater Injection Plant (SIP) for disposal. In the event the SIP cannot be used, treated domestic wastewater would be trucked to the Prudhoe Bay Operations Center-Wastewater Treatment Plant for disposal under general permit authorization AKG570006. As a result of eliminating these previous discharges, the existing Permit now covers Outfall 001 - Strainer Backwash System (SBS) as the only discharge.

2.0 BACKGROUND

2.1 Facility Information

The STP is located at the terminus of the West Dock Causeway on the mainland shoreline at the western end of Stefansson Sound in the Beaufort Sea, immediately west of Prudhoe Bay, Alaska (APPENDIX A. FIGURES – A.2). The STP strains, heats, bio-treats and de-aerates seawater drawn from Stefansson Sound for waterflood and other industrial uses. Injected waterflood is used to maintain formation pressures and allow enhanced oil recovery from production wells. Accordingly, treated waterflood is piped from the STP to the SIP and other infrastructure. The facility also provides water for the BPXA Grind and Inject Class I Underground Injection Control Facility and treated water for fire control. The facility has a firewater distribution system that serves onsite process areas and the living quarters. The firewater is untreated and unheated seawater distributed by pumps that require weekly testing. During weekly tests, the fire control test water is pumped to the inlet reservoir feeding the STP. If used to respond to a fire alarm or for fire suppression, the firewater from the STP process area would flow through floor drains and be pumped to a sump tank for ultimate disposal through underground injection. An STP Process Flow Diagram is presented in APPENDIX A. FIGURES – A.4.

Seawater destined for use as waterflood is strained to remove particulate suspended solids, detritus and other naturally occurring material to protect downstream treatment systems and to prevent the possibility of blocking the pore spaces in oil reservoir rock that could restrict the flow of oil into a producing well. The strained waterflood is then heated to enhance treatment performance and ultimately injection of the waterflood. Heating reduces viscosity and aids in stripping dissolved oxygen during the de-aeration process. Oxygen is a corrosive agent to carbon steel that makes up the pipelines used at the SIP. Levels of oxygen can be as high as 15

milligrams per liter (mg/L) in winter months and the de-aeration process reduces oxygen levels down to 20 micrograms per liter (µg/L) to protect piping from corrosion. In addition, waterflood is treated with sodium hypochlorite and glutaraldehyde biocides to prevent biological growth that could also clog formation pore spaces including sulfate-reducing bacteria that can produce hydrogen sulfide.

During maintenance and repairs to the STP or SIP, it may be necessary to drain back the SIP or conduct hydrostatic testing of pipeline repairs. Ideally, untreated seawater would be used for hydrostatic testing but drain back water could contain small amounts of biocides, oxygen scavengers, and anticorrosive agents. Chemically treated drain back water would be discharged to intake reservoirs of the STP to mix with intake seawater and cycled through the STP with a fraction being discharged as strainer backwash through Outfall 001.

Strainer backwash is discharged to the receiving water of Stefansson Sound as one continuous discharge through Outfall 001 and is the only effluent to be routinely discharged from the STP under current and projected operations. The discharge is continuously monitored for total residual chlorine (TRC) with equipment calibrated to detect down to 10 µg/L. Similarly, effluent temperature is continuously monitored as well as the ambient receiving water at the intake reservoirs to provide paired data sets for reporting temperature differential. The offshore discharge for Outfall 001 is through a buried line oriented in a due north direction that terminates 340 meters (m) offshore of the end of the West Dock Causeway in 4.0 – 4.5 m of water with a 64 m (210 foot [ft]) multi-port diffuser. The diffuser consists of 22 ports spaced 10 ft (3.05 m) apart with 4 inch (11.43 centimeter [cm]) diameter nozzles and 1 ft (0.305 m) risers that are oriented 20 degrees from horizontal in the vertical direction. Alternating nozzles are oriented horizontally into and away from the prevailing current along the diffuser.

Treatment chemicals are typically not used upstream of the strainer backwash discharged to Outfall 001 and downstream chemically-treated waterflood could only enter the waste stream as a result of drain back for maintenance or repair activities. Although not typically used, BPXA requested in their application the provisional use of clarifying agents should it become necessary in the future to modify treatment to meet waterflood specifications. In 2011, a sodium hypochlorite injection port was relocated to mitigate the possibility of sodium hypochlorite leaking back into the intake reservoir (APPENDIX A. FIGURES - A.4). However, small amounts of sodium hypochlorite can show up in the strainer backwash during warm startup. Warm startup is accomplished by routing a side stream of strained seawater through a heat exchanger and back to the inlet reservoirs to maintain ice free conditions. Sodium hypochlorite is injected ahead of the heat exchanger to prevent biofouling, becomes mixed with seawater in the inlet reservoirs, and results in low concentrations of TRC being discharged with the strainer backwash along with an incidental thermal load. Hence, temperature, TRC, and chronic whole effluent toxicity (WET) from potential use of unidentified treatment chemicals are parameters of concern in the strainer backwash effluent.

2.2 Strainer Backwash System Effluent Characterization

Review of discharge monitoring reports (DMR) from March 2011 through May 2015 included the parameters of flow reported in million gallons per day (mgd), pH in standard units (SU), TRC in µg/L, temperature in degrees Celsius (° C), and chronic WET in chronic toxicity units (TU_c). Note that the marine water quality criteria for temperature is based on a 1 °C increase over the ambient receiving water temperature. To provide a direct comparison with marine water quality

criteria and limits from the existing Permit for temperature, DEC uses delta temperature (ΔT) as the parameter of concern, which is the effluent temperature minus the simultaneous receiving water ambient temperature. Only positive ΔT values were analyzed because negative values do not result in lowering of water quality of the receiving water per application of the State's temperature water quality standard (WQS). Table 1 compares available data to existing permit limits and applicable State water quality criteria.

Table 1: Effluent Characterization (March 2011 - May 2015) Outfall 001

Parameter (Units)	Data Set	Existing Limits		Marine Criteria		Observed Range (Low – High, Ave) [1]
		Maximum Daily Limit (MDL)	Average Monthly Limit (AML)	Acute	Chronic	
Flow (mgd)	94	12.4	---	---	---	0.9 – 7.9, 3.7
ΔT (° C) [2]	984	16/17.3 [3]		---	1° [4]	< 0.1 - **10.8, 7.6**
pH (SU)	94	6.0 to 9.0 at all times		6.5 to 8.5 at all times		**6.1 - 8.83**, 7.5 [5]
TRC (mg/L)	1255	150/50 [3]	320/150 [3]	13	7.5	< 10 - **60**, 10.37

Notes:
1. Values that exceed water quality criteria or existing limits are presented in bold.
2. Δ T ° C is effluent temperature minus ambient receiving water temperature. Only positive values were evaluated.
3. Open water limit/Under ice limit.
4. The marine water quality criteria is 1 °C above ambient temperature such that any ΔT greater than 1 ° C is exceeding the criteria.
5. Median used in lieu of mean.

Although the existing Permit required monitoring for chronic WET if biocide or other treatment chemicals were used upstream of the strainer, no chemicals were used during the term of the existing Permit. Accordingly, no chronic WET data is currently available. Based on the effluent characterization, a mixing zone for ΔT, TRC and pH is necessary and TRC and ΔT require a reasonable potential analysis (RPA).

2.3 Compliance History

DMRs and a compliance report from March 2011 to May 2015 were reviewed to determine if there had been exceedance of effluent limits but there were no observed exceedances for Outfall 001 discharges during this review period. However, the compliance report indicated there were 25 reporting non-compliance events due to late DMRs during the second and third quarters of 2013 and the first, third, and fourth quarters of 2015. Reporting non-compliance for the third quarter of 2013 was resolved but the remaining reporting non-compliance events appear to be unresolved. No enforcement actions have been initiated during the period of this review.

3.0 RECEIVING WATERBODY

3.1 Water Quality Standards

Section 301(b)(1)(C) of the CWA requires the development of limits in permits necessary to meet water quality standards by July 1, 1997. 18 AAC 83.435, conditions in permits must ensure compliance with Alaska WQS. The WQS are composed of waterbody use classifications, numeric and/or narrative water quality criteria, and an Antidegradation Policy. The use classification system designates the beneficial uses that each waterbody is expected to achieve. The numeric and/or narrative water quality criteria are the criteria deemed necessary by the State to support the beneficial use classification of each waterbody. The Antidegradation Policy ensures that the beneficial uses and existing water quality are maintained.

Waterbodies in Alaska are designated for all uses unless the water has been reclassified under 18 AAC 70.230 as listed under 18 AAC 70.230(e). Some waterbodies in Alaska can also have site–specific water quality criterion per 18 AAC 70.235, such as those listed in 18 AAC 70.236(b). The Department has determined that there has been no reclassification nor has site-specific water quality criteria been established at the location of the discharge from the permitted facility into Stefansson Sound. Accordingly, the Department has determined that all marine use classes must be protected. These marine use classes include: water supply; water recreation; growth and propagation of fish, shellfish, other aquatic life, and wildlife; and harvesting for consumption of raw mollusks or other raw aquatic life.

3.2 Water Quality Status of Receiving Water

Any part of a waterbody for which the water quality does not or is not expected to meet applicable WQS is defined as a "water quality limited segment" and placed on the State's impaired waterbody list. For an impaired waterbody, Section 303(d) of the CWA requires states to develop a Total Maximum Daily Load (TMDL) management plan for the waterbody. The TMDL documents the amount of a pollutant a waterbody can assimilate without violating WQS and allocates that load to known point sources and nonpoint sources.

Stefansson Sound is not included on *Alaska's Final 2010 Integrated Water Quality Monitoring and Assessment Report*, July 15, 2010 as an impaired waterbody nor is the subject waterbody listed as a CWA 303(d) waterbody requiring a Total Maximum Daily Load (TMDL). Accordingly, no TMDL has been developed for the subject water body. Stefansson Sound is a subset of the Beaufort Sea which is classified as a Category 2 waterbody on *Alaska's Final 2010 Integrated Water Quality Monitoring and Assessment Report*, July 15, 2010.

3.3 Mixing Zone Analysis

Per 18 AAC 70.240 – 70.270, as amended through June 23, 2003, the Department may authorize a mixing zone in an APDES permit. BPXA submitted a mixing zone application on September 3, 2015 requesting a 100 m chronic mixing zone for temperature associated with Outfall 001 based on what was authorized in the existing Permit. The mixing zone in the existing Permit was sized using Visual Plumes (VP) and modeling effluent temperatures with different summer and winter temperatures and critical hydrodynamic conditions representing open water and under ice conditions in the receiving water. This modeling approach resulted in a single 100 m radii mixing zone with seasonal difference in the authorized dilution factors and,

consequentially, different seasonal limits. DEC has decided to use a different approach that will result in a smaller chronic mixing zone that applies to all seasons.

Instead of evaluating seasonal receiving water temperatures, DEC has evaluated paired data sets that accounts for seasonal temperature differences (i.e., ΔT). In addition, per request by DEC a comparison between VP and CORMIX 10.0.2.0 GTS Mixing Zone Expert System model program (CORMIX) was provided by the applicant along with empirical mixing zone data obtained during a previous study for the facility. Ultimately, DEC elected to use CORMIX.

In summary, the Department used the CORMIX to remodel the mixing zone based upon the following:

- The mixing zones were modeled using maximum effluent concentrations for TRC and ΔT, water quality criteria, and critical receiving water conditions;
- The critical ambient conditions represent under ice, unstratified conditions and the 10th percentile current of 0.3 cm/s;
- Temperature was the pollutant of concern (POC) requiring the most dilution for chronic conditions. Evaluating temperature as the difference between the effluent temperature (ΔT) and that of the ambient receiving water at the time of discharge was found to be a better comparison of the data to the numeric limit of no increase above 1° C above the ambient temperature; and,
- Using the same critical receiving water conditions, the Department included an acute mixing zone for TRC in addition to the chronic mixing zone for temperature.

The result of this modified approach is authorization of a rectangular chronic mixing zone extending from the seafloor to the top of the unfrozen water column that is 40 meters long in a direction perpendicular to the diffuser by 104 meters wide centered on the 64 meter diffuser and without applying different seasonal dilution factors. The authorized chronic dilution factor is 10.75, which approximately matches the maximum ΔT from the paired temperature data set. The Department is also authorizing a rectangular acute mixing zone extending from the seafloor to the top of the unfrozen water column that is 10 meters long by 74 meters wide centered on the diffuser and an acute dilution factor of 4.5 based on TRC as the driving parameter.

APPENDIX D, Mixing Zone Analysis Checklist outlines criteria per mixing zone regulations that must be considered when the Department reviews an application for mixing zones. These criteria include the size of the mixing zone, treatment technology, and existing uses of the waterbody, human consumption, spawning areas, human health, aquatic life, and endangered species. The following summarizes the Department's regulatory mixing zone analysis:

3.3.1 Size

Per 18 AAC 70.255, the Department determined that the size of the mixing zones for the wastewater discharge is appropriate and are as small as practicable. The size of the mixing zones are a small fraction of the area, or width of Stefansson Sound. Using the 10th percentile current velocity of 0.3 m/s, a drifting organism can traverse the acute mixing zone in approximately 2.8 minutes; well below the 15 minute duration used to evaluate lethality. Applicable water quality criteria protecting human health and aquatic life are met at the boundary of the chronic mixing zone. Given the low concentrations of pollutants, dispersion of the discharge plume, and the absence of sensitive aquatic resources within the vicinity,

toxic effects in the water column, sediment, or biota outside the chronic mixing zone will not occur.

3.3.2 Technology

Per 18 AAC 70.240(a)(3), the Department is required to determine if "an effluent or substance will be treated to remove, reduce, and disperse pollutants, using methods found by the Department to be the most effective and technologically and economically feasible, consistent with the highest statutory regulatory treatment requirements" before authorizing a mixing zone. Applicable "highest statutory and regulatory requirements" are defined in 18 AAC 70.990(30) [2003]. Accordingly, there are three parts to the definition, which are:

1. Any federal TBEL identified in 40 CFR 125.3 and 40 CFR 122.29, as amended through August 15, 1997, adopted by reference at 18 AAC 83.010;
2. Minimum treatment standards in 18 AAC 72.040; and
3. Any treatment requirement imposed under another state law that is more stringent than the requirement of this chapter.

The first part of the definition includes all applicable federal technology-based ELGs that may be adopted by reference at 18 AAC 83.010(g)(3) or TBELs developed using case-by-case best professional judgment (BPJ). There are no ELGs that apply to the Permit. However, similar to the existing permit, the Permit includes a TBEL developed using case-by-case BPJ for pH. The Department determines that the first part of the definition has been met.

The second part of the definition from the WQS appears to be in error, as 18 AAC 72.040 refers to discharges of sewage to sewers and not minimum treatment. The correct reference appears to be 18 AAC 72.050, minimum treatment for domestic wastewater. The application of 18 AAC 72.050 is not pertinent to the Permit as the discharge does not include domestic wastewater sources. Accordingly, the second part of the definition has been met.

The third part of the definition includes any treatment required by state law that is more stringent than 18 AAC 70. Other regulations beyond 18 AAC 70 that may apply to this permitting action include 18 AAC 83, 18 AAC 72 and 18 AAC 15. The Permit is consistent with 18 AAC 83 and neither the regulations in 18 AAC 15 nor another state legal requirement that the Department is aware of impose more stringent treatment requirements than 18 AAC 70. Therefore, the third and final part of the definition has also been met.

3.3.3 Existing Use

Per 18 AAC 70.245, the mixing zone has been appropriately sized to fully protect the existing uses of Stefansson Sound. Water quality criteria are developed to ensure protection of existing uses. The chronic mixing zone has been appropriately sized to ensure water quality criteria will be met at, and beyond, the boundary of the mixing zone. Accordingly, the mixing zone results in the protection of the existing uses of the waterbody as a whole.

3.3.4 Human Consumption

Per 18 AAC 70.250(b)(2) and (b)(3), the pollutants discharged cannot produce objectionable color, taste, or odor in aquatic resources harvested for human consumption; nor can the discharge preclude or limit established processing activities or commercial, sport, personal

use, or subsistence fish and shellfish harvesting. The mixing zone is not at a location where aquatic resources are harvested or that could result precluding or limiting established processing activities or commercial, sport, personal use, or subsistence fish and shellfish harvesting. In addition, there is no indication that the pollutants discharged could produce objectionable color, taste, or odor in aquatic resources harvested for human consumption if such resources existing at the location of the mixing zone.

3.3.5 Spawning Areas

Per 18 AAC 70.225(h), a mixing zone is not authorized in an area of anadromous fish spawning or resident fish for spawning redds, Arctic grayling, northern pike, rainbow trout, brook trout, cutthroat trout, whitefish, sheefish, Arctic char (Dolly Varden), burbot, and landlocked coho, king, and sockeye salmon. The permit does not authorize the discharge of effluent to open waters of a freshwater lake or river. Therefore, there are no associated discharges to anadromous fish spawning areas or the resident freshwater fish listed in the regulation.

3.3.6 Human Health

Per 18 AAC 70.250 and 18 AAC 70.255, the mixing zone authorized in the permit shall be protective of human health.

Per 18 AAC 70.250(d)(1), the Department has the authority to authorize mixing zones such that pollutants do not bioaccumulate, bioconcentrate, or persist above natural levels in sediments, water, or biota to significantly adverse levels (18 AAC 70.240(d)(1). The characterization of the effluent did not result in any parameter of concern that would pose a concern to human health or result in pollutants bioaccumulating, bioconcentrating, or persisting above natural levels in sediments, the receiving water, or biota.

3.3.7 Aquatic Life and Wildlife

Per 18 AAC 70.250 and 18 AAC 70.255, the mixing zone authorized in the permit shall be protective of aquatic life and wildlife and will not result in concentrations outside of the mixing zone that are undesirable, present a nuisance to aquatic life, permanent or irreparable displacement of indigenous organisms, or a reduction in fish or shellfish population levels. Based on the mixing zone size, low discharge volume, and the relatively quick rate at which POCs are diluted, there is no anticipation of lethality to drifting organisms. The Department therefore concludes aquatic life and wildlife will be maintained and protected.

3.3.8 Endangered Species

Per 18 AAC 70.250(a)(2)(D), the authorized mixing zone will not cause an adverse effect on threatened or endangered species. Species listed under the Endangered Species Act (ESA) that have some potential to be in the vicinity of the mixing zone are discussed in Section 8.1.

4.0 EFFLUENT LIMITS AND MONITORING REQUIREMENTS

4.1 Basis for Permit Effluent Limits

Per 18 AAC 83.015, the Department prohibits the discharge of pollutants to waters of the U.S. unless the permittee has first obtained a permit issued by the APDES Program that meet the purposes of Alaska Statute 46.03 and is in accordance with the CWA Section 402. Per these statutory and regulatory provisions, the Permit includes effluent limits that require the discharger to (1) meet standards reflecting levels of technological capability, (2) comply with 18 AAC 70 – WQS, and (3) comply with other state requirements that may be more stringent. The CWA requires that the limits for a particular pollutant be the more stringent of either TBELs or WQBELs.

The Permit includes numeric WQBELs and BMPs for temperature, TRC, and a TBEL using case-by-case BPJ for pH for strainer backwash from Outfall 001.

4.1.1 Technology Based Effluent Limits

As discussed in APPENDIX B, TBELs are either set using case-by-case best professional judgement (BPJ) or set via EPA rule makings in the form of Effluent Limitation Guidelines (ELGs) that correspond to the level of treatment achievable in selected industries using available treatment technology. There are no ELGs applicable to the discharge authorized under the Permit due to the absence of national effluent limitation guidelines for seawater treatment facilities. The previous permit established a TBEL through BPJ for pH. DEC has evaluated effluent characteristics and available treatment technologies and has concluded that the TBEL limit of 6.0 – 9.0 SU at all times is appropriate. The authorized chronic mixing zone includes this pH TBEL.

4.1.2 Water Quality Based Effluent Limits

4.1.2.1 Strainer Backwash (Outfall 001)

The Department has determined, based on available evidence, there is reasonable potential for the discharge of strainer backwash to exceed numeric water quality criteria for temperature, pH, and TRC at the point of discharge. The permittee has applied for mixing zones for these parameters as well as for settleable solids, turbidity, residues, and color. However, as discussed in Section 2.2, only temperature and TRC are evaluated in the RPA as the driving parameters for the chronic and/or acute mixing zones, respectively.

4.1.2.2 Reasonable Potential Procedure for Strainer Backwash (Outfall 001)

Temperature and TRC are the driving parameters for the chronic mixing zone and acute mixing zones, respectively. In APPENDIX C, the Department determined there is reasonable potential for TRC and ΔT to exceed, or contribute to an exceedance, of water quality criteria for temperature and TRC. In APPENDIX B, the Department developed the following WQBELs for ΔT and TRC.

4.1.2.3 WQBELs for Strainer Backwash (Outfall 001)

TRC WQBELs: The resulting MDL is 60.0 μg/L and the AML is 41.0 μg/L. However, the both of these limits are below what is quantifiable using EPA-approved methods in

40 CFR 136. DEC establishes the minimum level (ML) for TRC of 100 µg/L as the compliance limit for these WQBELs. Because the facility uses continuous TRC monitoring equipment calibrated to 10 µg/L rules for reporting and averaging are necessary.

For reporting on DMRs, if the monitoring equipment reports values that are less than 10 µg/L, then the permittee reports < 10 µg/L on the DMR. If the equipment reports between 10 µg/L and 100 µg/L, the permittee reports < 100 µg/L on the DMR. If the equipment records 100 µg/L or greater, the permittee reports the actual value on the DMR.

For averaging purposes, if the equipment records a value that is less than 10 µg/L, the permittee uses zero for averaging. If the equipment records a value between 10 µg/L and 100 µg/L, the permittee uses 10 µg/L for averaging. Lastly, if the equipment reports 100 µg/L or greater, the permittee uses the actual value for averaging.

Temperature Differential (T): The WQBEL derivation resulted in an MDL of 20.0°C for ΔT. The permittee must continue to monitoring the receiving water at the intake bay simultaneously with the effluent to demonstrate compliance with the temperature limit. Temperature monitoring is only applicable when there is a discharge occurring. Hence, the permittee is not required to monitor and report temperature differential if there is no discharge occurring.

4.2 Effluent Limits and Monitoring Requirements

Per AS 46.03.110(d), the Department may specify in a permit the terms and conditions under which waste material may be disposed. Monitoring in a permit is required to determine compliance with effluent limits, to characterize the effluent or to assess impacts to the receiving water. The following sections provide the effluent limits and monitoring requirements for Outfall 001. See APPENDIX B for calculations used to derive these limits.

4.2.1 Outfall 001 Strainer Backwash

The Permit requires the limitation and monitoring requirements as per Table 1.

Table 2: Effluent Limits and Monitoring Requirements for Strainer Backwash (Outfall 001)

Parameter	Effluent Limits			Monitoring Requirements	
	Units	MDL	AML	Frequency	Type
Flow	mgd	12.4	Report	Continuous	Meter
pH [4.2.1.1]	SU	6.0 to 9.0		1/Week	Meter or Grab
Temperature Differential (ΔT) [4.2.1.2]	° C	20.0	N/A	1/Week	Meter or Grab
TRC [4.2.1.3]	µg/L	60.0	41.0	1/Week	Meter or Grab
Chronic WET [4.2.1.3 and 4.2.1.4]	TU_c	Report	N/A	Annually	Grab

4.2.1.1 pH Conditions

The pH must not be less than 6.0 or greater than 9.0. The permittee must report the monthly maximum and monthly minimum on the DMR.

4.2.1.2 ΔT Conditions

Temperature differential is the effluent temperature minus the receiving water temperature. Receiving water temperature can be monitored at the seawater intake reservoirs. The permittee must record the weekly maximum ΔT and submit the data with the next application for reissuance.

4.2.1.3 Chemical Inventory

The permittee must maintain an annual inventory of chemical additives used upstream of the strainer. However, this requirement does not pertain to use of hypochlorite during periods of warm startup or chemicals used for treatment of waterflood downstream of the strainer unless these chemicals are circulated through the seawater intake reservoirs as part of SIP pipeline drain back. The annual inventory must include the following three components:

1) type of each chemical used (product name),
2) total volume of the chemicals used for the applicable month, and
3) total volume of seawater treated during the applicable month.

An applicable month is a month where chemicals have been used upstream of the strainer or where drain back of waterflood containing treatment chemicals has been circulated through the seawater intake reservoirs. See Section 4.2.1.4 for specific BMPs and chronic WET monitoring requirements.

4.2.1.4 Chronic WET Monitoring Conditions

Chronic WET monitoring per Section 4.2.2 is required if chemical additives (e.g., biocides or clarifying agents) are used upstream of the strainer such that chemicals are in the discharge. The permittee must notify DEC if chemical additives or drain back to the intake reservoirs becomes necessary. However, this requirement does not pertain to use of hypochlorite during periods of warm startup. Monitoring is also required if chemically treated waterflood is circulated through the intake reservoirs (i.e., drain back of waterflood from the SIP pipeline). Alternatively, the permittee may develop and implement specific BMPs that ensure no chemicals are in the waterflood at the time of circulating through the intake reservoir to void this monitoring requirement for chronic WET. Chronic WET monitoring samples must be collected in a manner that results in representation of maximum chemical dosing for the purpose of characterizing the effluent. See Section 4.2.1.3 for chemical inventory requirements.

4.2.2 Chronic WET Monitoring

If required by the Permit, chronic WET testing must be conducted for the following vertebrate and invertebrate species:

- Vertebrate (survival and growth): Atherinops affinis (Topsmelt). In the event that topsmelt is not available, Menidia beryllina (inland silverside) may be used as a substitute. Each WET report shall document the species used in testing.
- Invertebrate: For larval development tests, the permittee must use bivalve species Crassostrea gigas (Pacific Oyster) or Mytilus sp. (mussel). The initial screening of invertebrate testing shall also include the mysid shrimp, Americamysis bahia (formally

Mysidopsis bahia) for survival and growth. Due to seasonal variability, testing may be performed during reliable spawning periods (e.g., December through February for mussels and June through August for oysters).

A series of at least five dilutions and a control must be tested. The recommended initial dilution series is 6.25, 12.5, 25, 50, and 75% along with a control of dilution water (0% effluent). If a test does not identify the 25 % effect concentration (EC_{25}) for a specific species and inhibition endpoint, DEC may require subsequent tests to use a modified dilution series that increases the likelihood of observing the EC_{25} endpoint and providing more accurate estimates of chronic toxicity. In addition, the permittee may request written approval from DEC to modify the dilution series based on previous test results.

The presence of chronic toxicity shall be estimated as specified in EPA Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Marine and Estuarine Organisms, Third Edition (EPA-821-R-02-014). For the bivalve species, chronic toxicity must be estimated as specified in Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Water to West Coast Marine and Estuarine Organisms (EPA/600/R-95/136). Both the no observed effect concentration (NOEC) and 25 % inhibition concentration (IC_{25}), or EC_{25}, must be provided in the full WET report. The chronic toxicity results reported on the DMR must use $TU_c = 100/IC_{25}$ or $100/EC_{25}$. The reported EC_{25} or IC_{25} must be the lowest point estimate calculated for the applicable survival, growth, or fertilization endpoints. If the endpoint is estimated to be above the highest dilution, the permittee must indicate this on the DMR by reporting a less than value for TU_c based on the highest dilution. The Department may compare the reported TU_c based on IC_{25} with one based on NOEC during evaluation of data during the next Permit reissuance. Although acute WET monitoring is not required, the permittee must estimate acute toxicity based on observations of mortality during chronic tests and include this information in the WET report.

The Permit specifies semi-annual Chronic WET testing of both vertebrate and invertebrate species in order to identify the most sensitive test species for toxicity testing. Upon identification of the most sensitive test species, the permittee may submit supporting information (e.g., historic findings of the most sensitive species) and request DEC approval to discontinue WET testing of the less sensitive species. The permittee shall not make any changes to the selection of test species or dilution series without prior written approval by DEC.

The logistics of shipping WET samples to the lower 48 (contiguous United States) can be challenging as poor weather delays or missed connections during shipping can result in violation of the standard 36-hour hold time. If extenuating circumstances occur, WET samples hold times can exceed 36 hours but must not exceed 72 hours. The permittee must document the conditions that resulted in the need for the holding time to exceed 36 hours and any potential effect the extended hold time could have on the test results. The permittee must conduct chronic WET monitoring once per year when biocides other than sodium hypochlorite are used unless sodium hypochlorite is the only biocide used that year.

4.2.3 Electronic Discharge Monitoring Reports

4.2.3.1 E-Reporting Rule, Phase I

The permittee must submit DMRs electronically through NetDMR per Phase I of the E-Reporting Rule (40 CFR 127) upon the effective date of the Permit. For access to the NetDMR Portal, go to https://cdxnodengn.epa.gov/oeca-netdmr-web/action/login. DMRs submitted in compliance with the E-Reporting Rule are not required to be submitted as described in Permit Appendix A – Standard Conditions unless requested or approved by the Department. DEC has established an e-Reporting Information website at http://dec.alaska.gov/water/Compliance/EReportingRule.htm which contains general information about this new reporting format. Training modules and webinars for NetDMR can be found at https://netdmr.zendesk.com/home.

4.2.3.2 E-Reporting Rule, Phase II

Phase II of the E-Reporting Rule Permittees will integrate electronic reporting for all other reports required by the Permit (e.g., Annual Reports and Certifications) and implementation is expected to begin around December 2020. Permittees should monitor DEC's E-Reporting website (http://dec.alaska.gov/water/Compliance/EReportingRule.htm) for updates on Phase II of the E-Reporting Rule and will be notified when they must begin submitting all other reports electronically. Until such time, other reports required by the Permit may be submitted in accordance with Permit Appendix A – Standard Conditions.

4.2.4 Additional Effluent Monitoring

The permittee has the option of taking more frequent samples than required under the Permit, or DEC may request this additional information. These additional samples can be used for averaging if they are conducted using the Department approved test methods (generally found in 18 AAC 70 and 40 CFR 136 [adopted by reference in 18 AAC 83.010], and if the method detection limits are less than the effluent limitations and are sufficiently sensitive. All data collected during the Permit term must be provided to the Department with the next application for reissuance. This information is necessary to adequately characterize the effluent and conduct an RPA.

5.0 ANTIBACKSLIDING

Per 18 AAC 83.480, "effluent limitations, standards, or conditions must be at least as stringent as the final effluent limitations, standards, or conditions in the previous permit." Per 18 AAC 83.480, a permit may not be reissued "to contain an effluent limitation that is less stringent than required by effluent guidelines in effect at the time the permit is renewed or reissued."

Effluent limitations may be relaxed as allowed under 18 AAC 83.480, CWA §402(o) and CWA §303(d)(4). 18 AAC 83.480(b) allows relaxed limitations in renewed, reissued, or modified permits when there have been material and substantial alterations or additions to the permitted facility that justify the relaxation, or, if the Department determines that technical mistakes were made.

CWA §303(d)(4)(A) states that, for waterbodies where the water quality does not meet applicable WQS, effluent limitations may be revised under two conditions, the revised effluent limitation must ensure the

attainment of the WQS (based on the waterbody TMDL or the waste load allocation) or the designated use which is not being attained is removed in accordance with the WQS regulations.

CWA §303(d)(4)(B) states that, for waterbodies where the water quality meets or exceeds the level necessary to support the waterbody's designated uses, WQBELs may be revised as long as the revision is consistent with the State's Antidegradation Policy. Even if the requirements of CWA §303(d)(4) or 18 AAC 83.480(b) are satisfied, 18 AAC 83.480(c) prohibits relaxed limits that would result in violations of WQS or ELGs (if applicable).

State regulation 18 AAC 83.480(b) only applies to effluent limitations established on the basis of CWA Section 402(a)(1)(B), and modification of such limitations based on effluent guidelines that were issued under CWA Section 304(b). Accordingly, 18 AAC 83.480(b) applies to the relaxation previously established case-by-case TBELs developed using BPJ. To determine if backsliding is allowable under 18 AAC 83.480(b), the regulation provides five regulatory criteria [18 AAC 83.480(b)(1-5)] that must be evaluated and satisfied.

Data from Outfall 001 collected during the previous permit term was evaluated by the Department using the *Reasonable Potential Analysis and Effluent Limits Development Guide, June 30, 2014 (RPA/WQBEL Guidance)*, which resulted in a WQBEL for temperature that is less stringent than limits for temperature in the existing Permit. The *RPA/WQBEL Guidance* uses different methods for calculating the MDL for temperature than was used by EPA during development of the existing Permit. In addition, the less stringent limit in the Permit is based on new data and mixing zone authorization. DEC has also modified chronic WET conditions, frequency, and removal of toxicity triggers, based on the infrequent use of chemicals; no chemicals were used during the previous permit term that would have triggered chronic WET testing. These less stringent limits and conditions comply with WQS including the Antidegradation Policy (See Section 6.0), which is consistent with CWA §303(d)(4)(B).

6.0 ANTIDEGRADATION

Section 303(d)(4) of the CWA states that, for waterbodies where the water quality meets or exceeds the level necessary to support the designated uses of the waterbody, WQBELs may be revised as long as the revision is consistent with the State Antidegradation Policy.

The Antidegradation Policy per 18 AAC 70.015 states that the existing water uses and the level of water quality necessary to protect existing uses must be maintained and protected. This section of the fact sheet analyzes and provides rationale for the Department decision to reissue the Permit with respect to the Antidegradation Policy.

The Department's approach in implementing the Antidegradation Policy, found in 18 AAC 70.015, is currently based on the requirements in 18 AAC 70 and the *Policy and Procedure Guidance for Interim Antidegradation Implementation Methods, July 14, 2010* (*Interim Methods*). Using these requirements and policies, the Department determines whether a waterbody, or portion of a waterbody, is classified as Tier 1, Tier 2, or Tier 3 where a higher numbered tier indicates a greater level of water quality protection. The receiving water for discharges from the facility is Stefansson Sound, Prudhoe Bay, which is a Tier 2 water.

Wastewater authorized to be discharged under the Permit is subject to a Tier 2 antidegradation analysis, as detailed in the *Interim Methods*. The State Antidegradation Policy in 18 AAC 70.015(a)(2) states that if the quality of water exceeds levels necessary to support propagation of fish, shellfish, and wildlife and recreation in and on the water (Tier 2), that quality must be maintained and protected unless the

Department finds that the five specific requirements of the antidegradation policy at 18 AAC 70.015(a)(2)(A)-I are satisfied. These five findings are:

1. **18 AAC 70.015 (a)(2)(A).** *Allowing lower water quality is necessary to accommodate important economic or social development in the area where the water is located.*

   Based on the evaluation required per 18 AAC 70.015(a)(2)(D) below, the Department has determined that the most reasonable and effective pollution prevention, control, and treatment methods are being used and that the localized lowering of water quality is necessary.

   The Alaska Oil and Gas Association (AOGA) 2014 Economic Impact Study (AOGA Study) indicates that the petroleum industry is easily the top employer in the North Slope Borough generating 2,000 direct, support, or indirect jobs with wages paid totaling $115 million in 2013. In addition, the oil and gas industry paid $347.5 million in property taxes to the NSB in 2013 contributing 99.2% of total Borough tax revenues.

   The 2014 Annual Report by the Alaska Department of Natural Resources, Oil and Gas Division, states that since 1964, oil and gas leases sales involving North Slope and Beaufort Sea acreage, representing a total of 5 million acres have been made by the State. The report indicates that BPXA accounts for about two-thirds of Alaska's oil production, not including shares it owns in four other North Slope pipelines or significant interest in six other producing fields. BPXA is also the largest partner in the Trans-Alaska Pipeline System. The waterflood operation is of critical importance to BPXA and the State for providing for the injection of treated seawater into aging oil reservoirs to enhance oil recovery from production wells as well as water for its Class I Grind and Inject Underground Injection Control disposal well. The increase in oil production supports the financial wellbeing of the North Slope and State of Alaska.

   The Department finds that the requirements of this part of the antidegradation analysis have been met.

2. **18 AAC 70.015 (a)(2)(B).** *Except as allowed under this subsection, reducing water quality will not violate the applicable criteria of 18 AAC 70.020 or 18 AAC 70.235 or the whole effluent toxicity limit in 18 AAC 70.030.*

   The Department evaluated the applicable criteria in 18 AAC 70.020 while establishing permit limits and conditions. A chronic mixing zone has been authorized for TRC, pH, and temperature. The size of the authorized chronic mixing zones was developed to ensure water criteria will be met at, and beyond, the boundary. There are no site-specific criteria addressed by the Permit so 18 AAC 70.235 does not apply. In addition, WET testing in the Permit consists of monitoring only so WET limits associated with 18 AAC 70.030 also do not apply. Therefore, DEC concludes that the finding is met.

3. **18 AAC 70.015(a)(2)(C).** *The resulting water quality will be adequate to fully protect existing uses of the water.*

   Water quality criteria are established such that, if the criteria are met, the uses of the waterbody will be protected. DEC developed and incorporated narrative and numeric permit limits based on meeting the most stringent water quality criteria applicable to all uses of the waterbody. Because the criteria are being met at and beyond, the boundary of the acute and chronic mixing zones, the uses of the waterbody, as a whole are being protected. Therefore, DEC concludes that the finding is met.

4. **18 AAC 70.015(a)(2)(D).** *The methods of pollution prevention, control, and treatment found by the department to be most effective and reasonable will be applied to all wastes and other substances to be discharged.*

   Strainer backwash generated by STP operations is effectively controlled by BMP requirements and limits set out in this Permit. The Permit requires the permittee to follow prescribed requirements via developing a BMP Plan and implementation schedule to achieve the following two primary objectives:

   1. The number and quantity of pollutants and the toxicity of effluent generated, discharged, or potentially discharged at the facility shall be minimized by the permittee to the extent feasible by managing each potential influent waste stream in the most appropriate manner.
   2. Under the BMP Plan, any Standard Operating Procedures (SOPs) must be included in the Plan to ensure proper operation and maintenance of the STP.

   DEC has determined human health and the environment is protected and finds the most reasonable and effective pollution prevention, control, and treatment is being used.

5. **18 AAC 70.015(a)(2)(I).** *All wastes and other substances discharged will be treated and controlled to achieve (i) for new and existing point sources, the highest statutory and regulatory requirements; and (ii) for nonpoint sources, all cost-effective and reasonable best management practices.*

   Applicable "highest statutory and regulatory requirements" are defined in 18 AAC 70.990(30), as amended through June 26, 2003, and *Interim Methods*. Accordingly, there are three parts to the definition, which are:

   - Any federal TBEL identified in 40 CFR 125.3 and 40 CFR 122.29. as amended through August 15, 1997, adopted by reference at 18 AAC 83.010;
   - Minimum treatment standards in 18 AAC 72.040; and
   - Any treatment requirement imposed under another state law that is more stringent than the requirement of this chapter.

   The first part of the definition includes all applicable federal technology-based ELGs adopted by reference at 18 AAC 83.010(g)(3). There are no applicable federal ELGs for seawater treatment facilities. A pH TBEL is established using case-by-case BPJ. Therefore this part of the definition does not apply to the Permit.

   The second part of the definition is in error and inapplicable to STP discharges as discussed previously in Section 3.3.2.

   The third part of the definition includes any treatment required by state law that is more stringent than 18 AAC 70. Other regulations beyond 18 AAC 70 that may apply to this permitting action include 18 AAC 83 and 18 AAC 15. The Permit is consistent with 18 AAC 83 and neither the regulations in 18 AAC 15, or other state legal requirement(s) the Department is aware of, impose more stringent treatment requirements than 18 AAC 70.

   In the absence of ELGs, DEC has concluded that this criterion has been met through the implementation of TBELs using case-by-case BPJ and implementation of BMPs to control

sources of pollution to ensure discharges are treated to the highest statutory and regulatory requirements.

7.0 OTHER PERMIT CONDITIONS

7.1 Standard Conditions

Permit Appendix A of the Permit contains standard regulatory language that must be included in all APDES permits. These requirements are based on the regulations and cannot be challenged in the context of an individual APDES permit action. The standard regulatory language covers requirements such as monitoring, recording, reporting requirements, compliance responsibilities, and other general requirements.

7.2 Quality Assurance Project Plan

The permittee is required to develop procedures to ensure that the monitoring data submitted are accurate and to explain data anomalies if they occur. The permittee is required to update the Quality Assurance Project Plan (QAPP) within 120 days of the effective date of the final Permit. Additionally, the permittee must submit a letter to the Department within 120 days of the effective date of the Permit stating that the plan has been implemented within the required time frame. The QAPP shall consist of standard operating procedures the permittee must follow for collecting, handling, storing and shipping samples; laboratory analysis; and data reporting. The plan shall be retained on site and made available to the Department upon request.

7.3 Best Management Practices Plan

A BMP Plan is a collection of controls and housekeeping measures which are intended to minimize or prevent the generation and the potential release of pollutants from a facility to the waters of the U.S. through normal operations and ancillary activities. Per CWA Section 402(a)(1), development and implementation of BMPs may be included as a condition in APDES permits. CWA 402(a)(1) authorizes DEC to include miscellaneous requirements that are deemed necessary to carry out the provision of the CWA in permits on a case-by-case basis. The BMP Plan must be developed to control or abate the discharge of pollutants in accordance with 18 AAC 83.475. A BMP Plan must include certain generic BMPs as well as specific BMPs for controlling pollutants. The Permit requires specific BMP Plan provisions for situations where the permittee needs to drain back waterflood from SIP pipeline into the seawater intake reservoirs for conduction maintenance and repairs or hydrostatic testing of facility pipelines.

7.3.1 Implementation and Maintenance of the BMP Plan

A permittee must develop a BMP Plan that achieves the broad objectives outlined in Section 7.3. The BMP Plan shall be located at the permitted facility and made available for Department review upon request. Electronic copies are appropriate so long as they are available during inspections. A qualified person must amend the BMP Plan whenever there is a change in the facility or in the operation of the facility that materially increases the generation of pollutants, their release, or potential release to receiving waters. Changes to the BMP Plan shall be consistent with the objectives and specific requirements as described in the Permit. Facility and environmental managers must review all change to the BMP Plan. Permittees must conduct an annual review and a certification statement must be submitted to

the Department annually. Written notice of BMP Plan development and implementation must be submitted to DEC for retention in the administrative record within 120 days after the effective date of the Permit. The BMP Plan must include the standard components per Section 7.3.2 and specific requirements in Section 7.3.3.

7.3.2 Standard BMP Plan Components

The BMP Plan must be consistent with the general guidance contained in Guidance Manual for Developing Best Management Practices (EPA 833-B-93-004, October 1993) or any subsequent revision. The BMP Plan must include, at a minimum, the following items:

- Statement of BMP policy. The BMP Plan must include a statement of management commitment to provide the necessary financial, staff, equipment, and training resources to develop and implement the BMP Plan on a continuing basis.
- Current copies of the Permit and previous three years of annual BMP Plan certification letters.
- Description, location, and sequence of activities, BMP control measures, any stabilization measures, final constructed site plans, drawings, and maps.
- A log of BMP modifications which documents maintenance and repairs of control measures, including date(s) of regular maintenance, date(s) of discovery of areas in need of repair/maintenance, and date(s) that the control measure(s) returned to full function;
- Description of any corrective action taken at the facility, including the event that caused the need for corrective action (include notice of non-compliance if reporting was required) and dates when problems were discovered and modifications occurred;
- Structure, functions, and procedures of the BMP Committee. The BMP Plan must establish a BMP Committee chosen by the permittee responsible for developing, implementing, and maintaining the BMP Plan.
- An identification and assessment of risks associated with accidental pollutant releases.
- Standard Operating Procedures (Generic BMPs) that include but are not limited to:
    - Good Housekeeping.
    - Security.
    - Materials compatibility.
    - Record keeping and reporting.
    - Operation and maintenance plans for wastewater treatment systems and BMP controls. Elements should include preventative maintenance and repair procedures that are developed in accordance with good engineering practices.
    - Use of local containment devices such as liners, dikes, and drip pans where chemicals are being unpackaged and where wastes are being stored and transferred.
    - Apply chemical cleaning compounds and disinfectants in accordance with manufacturer instructions and suggested application rates.
    - Employee training on BMP requirements and records of employee training date(s), etc.

- Inspections and regular evaluation of BMP controls including evaluation of planned facility modifications to ensure that BMP Plan is considered and adjusted accordingly.

7.3.3 Specific BMP Requirements

In addition to the generic BMPs listed in Section 7.3.2, DEC requires that specific BMPs be included in the BMP Plan for preventing treatment chemicals in waterflood that could be drained back to the seawater intake reservoirs to facilitate pipeline maintenance and repairs.

8.0 OTHER LEGAL REQUIREMENTS

8.1 Endangered Species Act

The Endangered Species Act (ESA) requires federal agencies to consult with the National Oceanic and Atmospheric Administration (NOAA), National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service (FWS) if their actions could beneficially or adversely affect any threatened or endangered species. As a state agency, DEC is not required to consult with these federal agencies regarding permitting actions. However, the Department voluntarily requested this information from these services on November 10, 2015 to inform permit development. The Department received a reply the same day informing us of the availability of a website that contains interactive maps for habitat ranges and a new contact person at NOAA's Ecological Services Branch. The Department reviewed the Marine Mammal Protection Map (MMPA) – interactive map for habitat ranges and found the following may occur in Stefansson Sound, Prudhoe Bay, Alaska at the vicinity of the discharge: Spotted Seal (Phoca largha), Beluga Whale (Delphinapterus leucas), Gray Whale (Eschrichtius robustus), Killer Whale (Orcinus orca), Narwhal (Monodon monoceros), Bearded Seal (Erignathus barbatus), Ringed Seal (Phoca hispida), and Bowhead Whale (Balaena mysticetus).

8.2 Essential Fish Habitat

Essential fish habitat (EFH) includes the waters and substrate (sediments, etc.) necessary for fish from commercially-fished species to spawn, breed, feed, or grow to maturity. The Magnuson-Stevens Fishery Conservation and Management Act (January 21, 1999) requires federal agencies to consult with NOAA when a proposed discharge has the potential to adversely affect (reduce quality and/or quantity of) EFH. Although DEC as a state agency is not required to consult with these federal agencies regarding permitting activities, the Department voluntarily requested this information November 10, 2015, from these services to inform permit development. The Department also inspected the NMFS interactive map of EFH and found the area in the vicinity of the discharges is EFH for the Arctic Cod.

No other North Pacific marine fish species were listed on the NMFS interactive website as having EFH in the general area of the discharges.

8.3 Permit Expiration

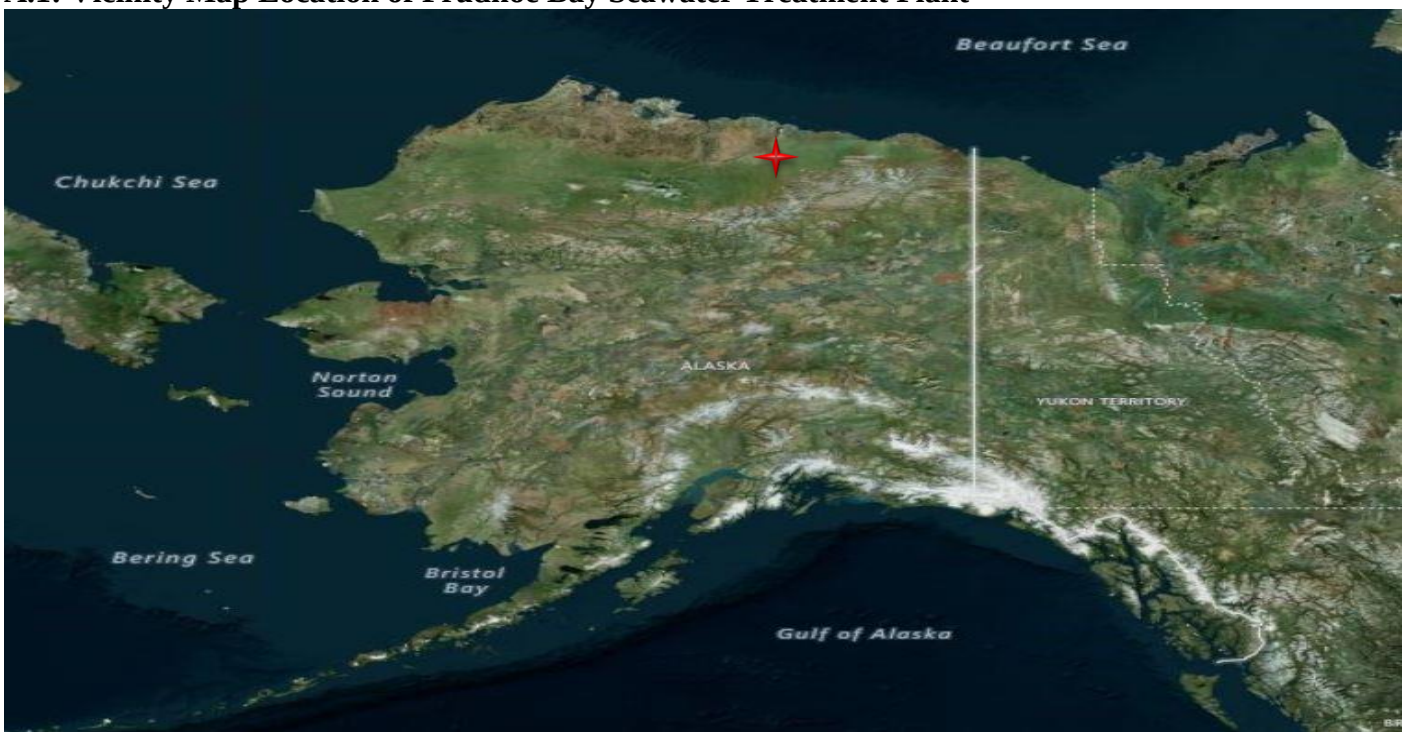
The permit will expire five years from the effective date of the permit.

9.0 REFERENCES

1. Alaska Department of Commerce, Community, and Economic Development. *Alaska Economic Performance Report*, 2013.
2. Alaska Department of Environmental Conservation, 2003. *Alaska Water Quality Criteria Manual for Toxics and Other Deleterious Organic and Inorganic Substances*, as amended through December 12, 2008.
3. Alaska Department of Environmental Conservation, 2010. *Alaska's Final 2010 Integrated Water Quality Monitoring and Assessment Report*, July 15, 2010.
4. Alaska Department of Environmental Conservation, 2003, 2009, and 2012. Alaska Water Quality Standards.
5. Alaska Department of Environmental Conservation. Interim Antidegradation Implementation Methods. Division of Water. Policy and Procedure No. 05.03.103. July 14, 2010.
6. Alaska Department of Natural Resources – Division of Oil and Gas, *Annual Report*, 2014.
7. Alaska Oil and Gas Association. *Economic Impact Report – The Role of the Oil and Gas Industry in Alaska's Economy*, May 2014.
8. Alaska Pollution Discharge Elimination System Discharge and Monitoring Report, 2013 – 2015.
9. Barnes, P.W. et al. *Ecosystems and Environments*, Academic Press, Inc. 1984.
10. Environmental Protection Agency. *Prudhoe Bay Seawater Treatment Plant 1994, 1995, 1996 Environmental Monitoring Program*, Kinnetic Laboratories Inc. January 1995, 1996, and 1997.
11. National Oceanic and Atmospheric Administration, 2015 *EFH Mapper. N.p.,n.d.* Web January 13, 2015.
12. National Oceanic and Atmospheric Administration, 2015 *MMPA Mapper. N.p.,n.d.* Web January 13, 2015.

APPENDIX A. FIGURES

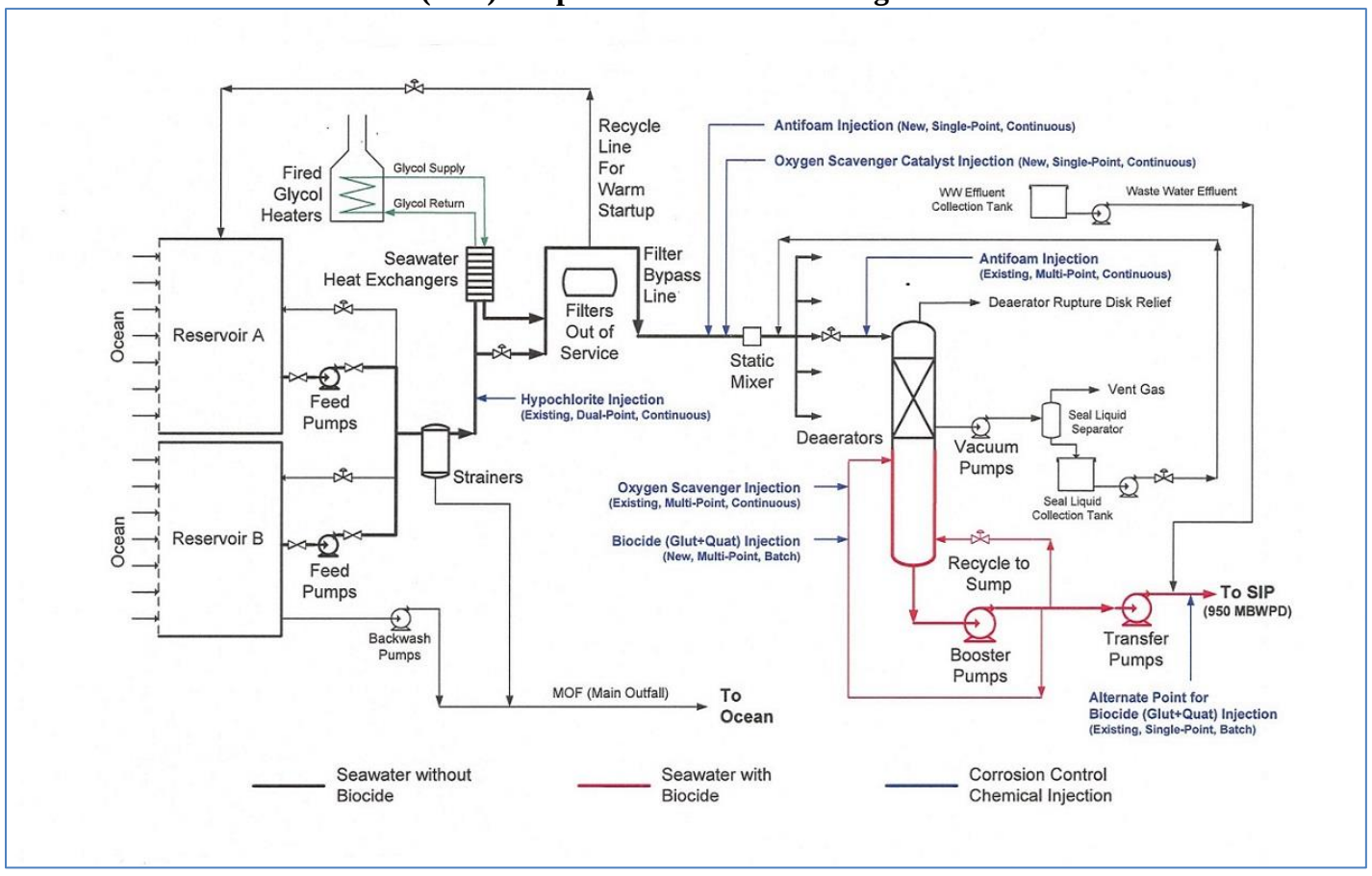
A.1: Vicinity Map Location of Prudhoe Bay Seawater Treatment Plant



A.1: BPXA-Prudhoe Bay Seawater Treatment Plant Stefansson Sound Outfall 001

A.3: Prudhoe Bay Seawater Treatment Plant

A.4: Seawater Treatment Plant (STP) Simplified Process Flow Diagram: After Modification



APPENDIX B. EFFLUENT LIMITATIONS

The Alaska Department of Environmental Conservation (Department or DEC) prohibits the discharge of pollutants to waters of the United States (U.S.) per Alaska Administrative Code (AAC) 18 AAC 83.015 unless first obtaining a permit issued by the Alaska Pollutant Discharge Elimination System (APDES) Program that meets the purposes of Alaska Statutes (AS) 46.03 and is in accordance with Clean Water Act (CWA) Section 402. Per these statutory and regulatory requirements, individual permit AK0029840 – BP Exploration (Alaska), Prudhoe Bay Seawater Treatment Plant (Permit) includes effluent limitations that require the discharger to (1) meet standards reflecting levels of technological capability, (2) comply with 18 AAC 70 – Alaska Water Quality Standards (WQS), (3) and comply with other state requirements that may be more stringent.

The CWA requires that the limits for a particular parameter be the more stringent of either technology-based effluent limits (TBEL) or water quality-based effluent limits (WQBEL). TBELs are set via rule makings by the Environmental Protection Agency (EPA) in the form of Effluent Limitation Guidelines (ELGs) that correspond to the level of treatment that is achievable using available technology. In situations where ELGs have not been developed or have not considered specific discharges or pollutants, a regulatory agency can develop TBELs using best professional judgment (BPJ) on a case-by-case basis. A WQBEL is designed to ensure that Water Quality Standards (WQS) per 18 AAC 70 are maintained and the waterbody as a whole is protected. WQBELs may be more stringent than TBELs. In cases where both TBELs and WQBELs have been generated, the more stringent of the two limits will be selected as the final permit limit.

B.1 TECHNOLOGY BASED EFFLUENT LIMITS

The Environmental Protection Agency (EPA) has not established national ELGs for seawater treatment facilities for waterflood production. However, the Department is adopting a TBEL developed using case-by-case BPJ for pH. The Permit requires pH to be no less than 6.0 standard units (SU) and no greater than 9.0 SU. This TBEL was also included in the existing Permit and is being retained in the proposed Permit.

B.2 WATER QUALITY BASED EFFLUENT LIMITS

B.2.1 Statutory and Regulatory Basis

Per 18 AAC 70.010, a person may not conduct an operation that causes, or contributes to, a violation of the WQS. Per 18 AAC 83.435(a), an APDES permit must include conditions (e.g., WQBELs) in addition to, or more stringent than established TBELs. When evaluating if WQBELs are needed in addition to TBELs, the permitting authority conducts a reasonable potential analysis (RPA) based on pertinent water quality parameters. Pertinent water quality parameters are those that the Department considers as having the potential to exceed water quality criteria at the point of discharge or at the boundary of a mixing zone, if authorized. If a mixing zone is authorized, the Department may consider the dilution available in the receiving water in the analysis. Per 18 AAC 435(c), DEC must also use procedures that account for effluent variability (e.g., maximum expected effluent concentrations [MEC] and coefficient of variation) and existing controls on point source (e.g., treatment systems) and nonpoint sources of pollution (e.g., ambient receiving water concentrations). The Department developed and implemented a *Reasonable Potential Analysis and Effluent Limits Development Guide, June 30, 2014 (RPA/WQBEL*

Guidance) and associated spreadsheet tool that were used in development of the WQBELs in the Permit.

B.2.1.1 *Reasonable Potential Analysis*

The RPA procedures use statistical methods to estimate MECs or, in the case of temperature in this permit, maximum expected temperature difference between effluent and the ambient receiving water (MEΔT). Using a mass balance approach, the RPA projects the concentration, or temperature, at the boundary of a mixing zone if authorized. Because DEC has authorized acute and chronic mixing zones, the mass balance procedure evaluates if the effluent exceeds, or contributes to an exceedance, of water quality criteria at the boundary of either the acute or the chronic mixing zone. Based on the RPA summarized in APPENDIX C, the Department has determined temperature has a reasonable potential to exceed chronic marine criteria the boundary of the chronic mixing zone and TRC at the boundary of the acute mixing zone. Accordingly, WQBELs for temperature (ΔT) and total residual chlorine (TRC) are established per 18 AAC 83.435 to be consistent with the calculated available wasteload allocation (WLA) and stringent enough to ensure compliance with WQS. No other parameters were determined to have reasonable potential.

B.2.1.2 *Total Residual Chlorine*

The RPA revealed that only TRC has reasonable potential to exceed water quality criteria at the boundary of the acute mixing zone requiring development of WQBELs. The TRC maximum daily limit (MDL) and average monthly limit (AML) are based on maximum expected effluent concentration equaling 60.0 micrograms per liter (µg/L), a calculated coefficient of variation (CV) of 0.2771 and an assumed four samples per month. The resulting MDL is 60 µg/L and AML is 40 µg/L. The following steps were conducted for calculation of the MDL and AML per Section 5.4 (Permit Limit Derivation) of the EPA Technical Support Document and DEC's *RPA/WQBEL Guidance.*

- **Determine Long Term Averages (LTAs):** The LTAs are calculated as follows:

  $LTA_{acute} = WLA\ [\exp(0.5\sigma^2 - Z_{99}\sigma)]$, where $\sigma^2 = \ln(CV^2 + 1)$

  $WLA = 60.0\ \mu g/L$, $CV = 0.2771$, $Z_{99} = 2.326$, $\sigma = 2.871$ and $\sigma^2 = 8.243$

  $LTA_{acute} = 32.96\ \mu g/L$

  $LTA_{chronic} = WLA\ [\exp(0.5\sigma_4^2 - Z_{99}\sigma_4)]$, where $\sigma_4^2 = \ln(CV^2/4 + 1)$

  $WLA = 60.0\ \mu g/l$, $CV = 2.771$, $Z_{99} = 2.326$, $\sigma_4 = 0.1379$ and $\sigma_4^2 = 0.0190$

  $LTA_{chronic} = 59.06\ \mu g/L$

- **Determine the most limiting (lowest) LTA**

  LTA_{acute} is most limiting = 32.96 µg/L

- **Calculate the MDL and AML**

  $MDL = LTA_{acute}\ [\exp(Z_{99}\sigma - 0.5\sigma^2)]$, where $\sigma^2 = \ln(CV^2 + 1)$

$CV = 2.771$, $Z_{99} = 2.326$, $\sigma = 2.871$, and $\sigma^2 = 8.243$

MDL = 59.8 µg/L
Roundup to 60.0 µg/L

$AML = LTA_{acute}\ [\exp(Z_{95}\sigma_4 - 0.5\sigma_4^2)]$, where $\sigma_4^2 = \ln(CV^2/4 + 1)$,

$CV = 2.771$, $Z_{95} = 1.645$, $\sigma = 0.1379$ and $\sigma_4^2 = 0.0190$

AML = 40.0µg/L

B.2.1.3 *Temperature Difference (ΔT)*

The RPA revealed that temperature (ΔT) has reasonable potential to exceed water quality criteria at the boundary of the chronic mixing zone requiring development of WQBELs. The MDL and AML are based on maximum expected effluent concentration equaling 10.8 degrees Celsius (°C), a calculated CV of 1.2619 and an assumed four samples per month. Because there is no acute criteria for temperature, there is also no LTA_a so LTA_c is the most limiting and is used in the derivation. Consistent with the existing Permit, DEC is establishing an MDL but not an AML. The resulting MDL is 20.0 °C. The following steps were conducted for calculation of the MDL per Section 5.4 (Permit Limit Derivation) of the EPA Technical Support Document and the DEC *RPA/WQBEL Guidance.*

- **Determine LTAs:** The LTAs are calculated as follows:

  $LTA_{chronic} = WLA\ [\exp(0.5\sigma_4^2 - Z_{99}\sigma_4)]$, where $\sigma_4^2 = \ln(CV^2/4 + 1)$

  $WLA = 10.8$ °C, $CV = 1.49$, $Z_{99} = 2.326$, $\sigma_4 = 0.6644$ and $\sigma_4^2 = 0.4415$

  $LTA_{chronic}$ = 2.86 °C

- **Calculate the MDL**

  $MDL = LTA_{chronic}\ [\exp(Z_{99}\sigma - 0.5\sigma^2)]$, where $\sigma^2 = \ln(CV^2 + 1)$

  $CV = 1.49$, $Z_{99} = 2.326$, $\sigma = 1.081$, and $\sigma^2 = 1.169$

  MDL = 19.7 °C
  Roundup to 20.0 °C

APPENDIX C. REASONABLE POTENTIAL DETERMINATION

The Alaska Department of Environmental Conservation (Department or DEC) determined if the permitted discharge has reasonable potential (RP) to cause or contribute to a violation of Alaska Water Quality Standards (WQS) in accordance with the Environmental Protection Agency (EPA) *Technical Support Document for Water Quality-Based Toxics Control, 1991 (TSD)* and the *DEC Reasonable Potential Analysis and Effluent Limits Development Guide, June 30, 2014 (RPA/WQBEL Limit Guide)*

The Department determines RP by comparing the maximum projected receiving waterbody concentration at the boundary of the acute or chronic mixing zone boundary water quality criteria for each parameter of Pollutant of Concern (POC). RP to exceed exists if the projected receiving waterbody concentration at the boundary of the respective mixing zone exceeds the applicable criteria for the POC and a water quality-based effluent limit must be included in the permit per (18 AAC 83.435). This Appendix discusses how the maximum projected receiving waterbody concentrations were determined for this discharge to marine waters and summarizes the calculations. To illustrate the unique procedures and calculations, both POCs (TRC and temperature) are included below.

C.1 MASS BALANCE

Normally, for a discharge of a parameter at the MEC into a marine receiving environment with a known ambient water concentration (AWC), the projected RWC is determined using a steady state model represented by the following mass balance equation:

$$(V_{MEC} + V_{AWC})RWC = V_{MEC} * MEC + V_{AWC} * AWC \qquad \text{(Equation C-1)}$$

where,

RWC = Receiving waterbody concentration downstream of the effluent discharge.

MEC = Maximum projected effluent concentration (or MET)

AWC = Ambient waterbody concentration, taken as the 85th percentile of data or 15 percent of the chronic criteria if no ambient data is available.

V_{MEC} = Volume of the maximum expected effluent discharged into the control volume.

V_{AWC} = Volume of the ambient receiving water in the control volume.

Definition:

Dilution Factor (DF), $DF = \frac{V_{MEC}+V_{AWC}}{V_{MEC}}$ (Equation C-2)

Upon separating variables in Equation C-1 and substituting Equation C-2 yields:

$$DF = \frac{(MEC - AWC)}{(RWC - AWC)} \qquad \text{(Equation C-3a)}$$

The preceding equation provides the dilution factor achieved at the boundary of the mixing zone if based on the MEC. To determine the dilution factor required to meet water quality criteria at the boundary, the water quality criteria (WQC) is substituted for RWC in Equation C-3a. However, for temperature

Equation C-3a is not directly applicable in the same manner because the marine water quality criteria for temperature is in reference to the instantaneous ambient receiving water temperature; the increase above ambient cannot be more than 1 °C (i.e., WQC = AWC +1). By making substitutions and using the descriptor "ΔT" for temperature instead of "C" for concentration, Equation C-3a can be rewritten to:

$$DF = \frac{(ME\Delta T - AWT)}{((AWT + 1) - AWT)}$$

Simplifying…

$$DF = ME\Delta T \qquad \text{Equation C-3b}$$

where,

$ME\Delta T$ = Maximum Effluent Temperature – Ambient Receiving Water Temperature

Rearranging Equation C-3a to solve for RWC yields:

$$RWC = \frac{(MEC - AWC)}{DF} + AWC \qquad \text{(Equation C-4a)}$$

In the case of temperature, Equation C-4 simplifies to the following equation:

$$RWC = \frac{ME\Delta T}{DF} + 1 \qquad \text{(Equation C-4b)}$$

C.2 MAXIMUM PROJECTED EFFLUENT CONCENTRATION

To calculate the MEC (or MEΔT), the Department uses the *RPA/WQBEL Guide* that uses modified procedures from the *TSD* Section 3.3. DEC uses a 95th confidence interval with a 99th percentile to determine a reasonable potential multiplier (RPM). In addition, DEC evaluates the distribution of the data set using EPA's *ProUCL Statistical Software Program, Version 4.1 (ProUCL)* rather than assuming a lognormal distribution as described in the TSD for calculating and applying the coefficient of variation (CV) in derivation equations. The possible statistical distributions include lognormal, normal, gamma, or non-parametric.

The RPM is calculated differently depending on the type of distribution, CV of the data, and the number of data points. When fewer than 10 data points are available, the *RPA/WQBEL Guide* assumes the CV = 0.6, a conservative estimate that assumes a relatively high variability.

The CV is defined as the ratio of the sample standard deviation of the data set to the sample mean.

$$CV = coefficient\ of\ variation = \frac{standard\ deviation}{mean},$$

For data sets with a Normal, Gamma, distribution or analyzed with the Non-parametric (Kaplan-Meier) method:

$$CV = \frac{\hat{\sigma}_y}{\hat{\mu}_y} \quad \text{(Equation C-5)}$$

Where: $\hat{\mu}_y = estimated\ mean = \frac{\sum[x_i]}{k}, 1 \le i \le k$

$\hat{\sigma}_y{}^2 = estimated\ variance = \sum \frac{[(x_i - \mu)^2]}{k-1}, 1 \le i \le k$

$\hat{\sigma}_y = estimated\ standard\ deviation = (\sigma^2)^{0.5}$

$k = number\ of\ samples$

For data sets with a Lognormal or Log-ROS distribution:

$$CV = [\exp(\hat{\sigma}_y^2) - 1]^{0.5} \quad \text{(Equation C-6)}$$

Where: $y_i = \ln(x_i)\ for\ i = 1,2, \dots, k$

$\hat{\mu}_y = mean = \sum(y_i)/k$

$\hat{\sigma}_y^2 = variance = \sum[(y_i - \hat{\mu}_y)^2]/(k-1)$

$k = number\ of\ samples$

The RPM is the ratio of the upper bound of the distribution at the 99th percentile to the percentile represented by the maximum observed concentration (MOC), at the 95% confidence level. The general equation (C-9) is followed by equations (C-10 and C-11) for data with a lognormal distribution is as follows:

$$RPM = \frac{C_{99}}{C_{pn}} \quad \text{(Equation C-7)}$$

$$C_{99} = \exp[(Z_{99} * \hat{\sigma}_y) - (0.5 * \hat{\sigma}_y^2)] \quad \text{(Equation C-8)}$$

$$C_{Pn} = \exp[(Z_{Pn} * \hat{\sigma}_y) - (0.5 * \hat{\sigma}_y^2)] \quad \text{(Equation C-9)}$$

In the case of data displaying no discernable distribution, equations for C_{99} and C_{pn} become:

$$C_{99} = \hat{\mu}_n + Z_{99} * \hat{\sigma} \quad \text{(Equation C-10)}$$

$$C_{Pn} = \hat{\mu}_n + Z_{Pn} * \hat{\sigma} \quad \text{(Equation C-11)}$$

In all Equations C-9, C-11, and C-13, the percentile represented by the MOC is:

$$p_n = (1 - confidence\ level)^{1/n} \quad \text{(Equation C-12)}$$

Where:

$p_n = the\ percentile\ represented\ by\ the\ MOC\ (or\ MO\Delta T)$

$$n = the\ number\ of\ samples$$

$$Confidence\ Level = 0.95\ for\ this\ analysis$$

In the event that an RPM that is calculated equals less than one (1), the value calculated defaults to a value of one (1) as per *RPA/WQBEL Guide*. The MEC is determined by multiplying the MOC by the RPM to derive the MEC:

$$MEC = (RPM) * (MRC) \qquad \text{(Equation C-13a)}$$

Or for Temperature Differential: $ME\Delta T = (RPM) * (MO\Delta T)$ (Equation C-13b)

If the RWC (acute or chronic) calculated by Equation C-4a or C-4b is found to exceed the respective criteria for the pollutant of concern, then reasonable potential exists for the parameter and a WQBEL must be developed for that parameter.

C.3 RPA CALCULATIONS FOR TOTAL RESIDUAL CHLORINE

The mixing zone analysis identified TRC as the driving parameter for the acute mixing zone. The Department authorizes an acute mixing zone with a DF of 4.6 and a chronic mixing zone with a DF of 10.75. The following calculations demonstrates TRC has reasonable potential to exceed, or contribute to an exceedance, at the boundary of the acute mixing zone.

Number of effluent data (n) = 1,255
MOC = 60 µg/L
The data was found to be normal with
$\hat{\mu_n}$ = 10.4, and
$\hat{\sigma}$ = 2.883

For a data set containing 1,255 TRC samples:

$$p_n = p_{1255} = (1 - 0.95)^{1/1255}$$

= 0.998

Because the data was found to not have a discernable distribution, the following equation applies to the RPM calculation per the *RPA/WQBEL Guide*.

$$RPM = \frac{\hat{\mu_n} + z_{99}\,\hat{\sigma}}{\hat{\mu_n} + p_n\,\hat{\sigma}}$$

Z_{99} = 2.326 for the 99 percentile (Calculated with Excel Spreadsheet)

$Z_{99.8}$= 2.82 for the 99.8 percentile (Calculated with Excel Spreadsheet)

Therefore,

RPM = (60.0 + 2.326 x 2.883)/(60.0 + 2.82 x 2.883) =

RPM = 0.979: **Therefore use the minimum RPM value = 1.0 per the** *RPA/WQBEL Guide***.**

Using Equation C-13a for acute and chronic TRC,

MEC = (1.0)(60 µg/L) = 60 µg/L (maximum projected effluent concentration),

AWC = 0

For DF_{acute} = 4.6:

$$RWC_{acute} = \frac{60\ ug/L\ -0\ mg/L}{4.6} + 0\ ug/L\ =\ 13.04\ \mu g/L$$

For $DF_{chronic}$ = 10.75:

$$RWC_{chronic} = \frac{60\ ug/L_e - 0\ ug/L}{10.75} + 0\ ug/L\ =\ 5.58\ \mu g/L$$

Because the RWC for TRC at the boundary of acute mixing zone is above the acute water quality criteria of 13 µg/L, TRC must have a WQBEL in the Permit.

C.4 RPA CALCULATIONS FOR TEMPERATURE DIFFERENTIAL (ΔT)

The mixing zone analysis identified ΔT as the driving parameter for the chronic mixing zone resulting in the Department authorizing a chronic mixing zone with a DF of 10.75. The following calculations demonstrate that ΔT has reasonable potential to exceed, or contribute to an exceedance, of temperature criteria at the boundary of the chronic mixing zone. Note that there is no acute temperature criteria and because the temperature differential is being evaluated, the applicable chronic criteria at the boundary of the chronic mixing zone is 1 degree Celsius (°C).

Number of effluent data (n) = 1,001
MOΔT = 10.8 °C
The data was found to be lognormal with
$\hat{\mu_n}$ = 0.929, and
$\hat{\sigma}$ = 1.384
CV = 1.49

For a data set containing 1,255 TRC samples:

$$p_n = p_{1001} = (1 - 0.95)^{1/1001}$$
$$= 0.997$$

Because the data was found to have a lognormal distribution, the following equation applies to the RPM calculation per the *RPA/WQBEL Guide*.

$$RPM = \frac{\exp(z_{99}\,\hat{\sigma}_y - 0.5\hat{\sigma}_y^2)}{\exp(Z_{Pn}\,\hat{\sigma}_y - 0.5\hat{\sigma}_y^2)}$$

Z_{99} = 2.326 for the 99 percentile (Calculated with Excel Spreadsheet)

$Z_{99.7}$= 2.75 for the 99.7 percentile (Calculated with Excel Spreadsheet)

The log-transformed standard deviation and variance is obtained by rearranging Equation C-8 and using the CV value of 1.49. This results in an $\hat{\sigma}_y^2$ and $\hat{\sigma}_y$ of 1.169 and 1.081, respectively.

Therefore,

RPM = exp(2.326 x 1.081 – 0.5 x 1.169)/exp(2.75 x 1.081 – 0.5 x 1.169) =

RPM = 0.633: **Therefore use the minimum RPM value = 1.0 per the** *RPA/WQBEL Guide***.**

Using Equation C-13b for MEΔT,

MEΔT = (1.0)(10.8 °C) = 10.8 °C (maximum projected effluent concentration),

For $DF_{chronic}$ = 10.75:

$$RWC_{chronic} = \frac{10.8\ °C}{10.75} = 1.01\ °C$$

Because the RWC for ΔT at the boundary of chronic mixing zone is above 1 °C, the Permit must have a WQBEL ΔT.

APPENDIX D. MIXING ZONE ANALYSIS CHECKLIST

Mixing Zone Authorization Checklist

based on Alaska Water Quality Standards (2003)

The purpose of the Mixing Zone Checklist is to guide the permit writer through the mixing zone regulatory requirements to determine if all the mixing zone criteria presented in the Alaska Administrative Code (AAC) at 18 AAC 70.240 through 18 AAC 70.270 are satisfied, as well as provide justification to authorize a mixing zone in an Alaska Pollution Discharge Elimination System permit. In order to authorize a mixing zone, all criteria must be met. The permit writer must document all conclusions in the permit Fact Sheet. However, if the permit writer determines that one criterion cannot be met, then a mixing zone is prohibited, and the permit writer need not include in the Fact Sheet the conclusions for when other criteria were met.

Criteria	Description	Resources	Regulation	Mixing Zone Approved Y/N
Size	Is the mixing zone as small as practicable? - Applicant collects and submits water quality ambient data for the discharge and receiving waterbody (e.g. flow and flushing rates)	Yes •Technical Support Document for Water Quality Based Toxics Control •Water Quality Standards Handbook • DEC's RPA Guidance • EPA Permit Writers' Manual Fact Sheet Section 3.3.1	18 AAC 70.240 (a)(2) 18 AAC 70.245 (b)(1) - (b)(7) 18 AAC 70.255(e) (3) 18 AAC 70.255 (d)	Y
Technology	Were the most effective technological and economical methods used to disperse, treat, remove, and reduce pollutants? **If yes**, describe methods used in Fact Sheet at Section 3.3 Mixing Zone Analysis. Attach additional documents if necessary.	Yes Fact Sheet Section 3.3.2	18 AAC 70.240 (a)(3)	Y

Criteria	Description	Resources	Regulation	Mixing Zone Approved Y/N
Low Flow Design	**For river, streams, and other flowing fresh waters.** - Determine low flow calculations or documentation for the applicable parameters. Justify in Fact Sheet	N/A – Marine Discharge	18 AAC 70.255(f)	
Existing use	Does the mixing zone…			
	(1) partially or completely eliminate an existing use of the waterbody outside the mixing zone? **If yes, mixing zone prohibited.**	No Fact Sheet Section 3.3.3	18 AAC 70.245(a)(1)	Y
	(2) impair overall biological integrity of the waterbody? **If yes, mixing zone prohibited.**	No Fact Sheet Section 3.3.3	18 AAC 70.245(a)(2)	Y
	(3) provide for adequate flushing of the waterbody to ensure full protection of uses of the waterbody outside the proposed mixing zone? **If no, then mixing zone prohibited.**	Yes Fact Sheet Section 3.3.3	18 AAC 70.250(a)(3)	Y
	(4) cause an environmental effect or damage to the ecosystem that the Department considers to be so adverse that a mixing zone is not appropriate? **If yes, then mixing zone prohibited.**	No Fact Sheet Section 3.3.3	18 AAC 70.250(a)(4)	Y
	Does the mixing zone…			

Criteria	Description	Resources	Regulation	Mixing Zone Approved Y/N
Human consumption	(1) produce objectionable color, taste, or odor in aquatic resources harvested for human consumption? **If yes, mixing zone may be reduced in size or prohibited.**	No Fact Sheet Section 3.3.4	18 AAC 70.250(b)(2)	Y
	(2) preclude or limit established processing activities of commercial, sport, personal use, or subsistence shellfish harvesting? **If yes, mixing zone may be reduced in size or prohibited.**	No Fact Sheet Section 3.3.4	18 AAC 70.250(b)(3)	Y
Spawning Areas	Does the mixing zone…			
	(1) discharge in a spawning area for anadromous fish or Arctic grayling, northern pike, rainbow trout, lake trout, brook trout, cutthroat trout, whitefish, sheefish, Arctic char (Dolly Varden), burbot, and landlocked coho, king, and sockeye salmon? **If yes, mixing zone prohibited.**	No Fact Sheet Section 3.3.5	18 AAC 70.255 (h)	Y
Human Health	Does the mixing zone…			
	(1) contain bioaccumulating, bioconcentrating, or persistent chemical above natural or significantly adverse levels? **If yes, mixing zone prohibited.**	No Fact Sheet Section 3.3.6	18 AAC 70.250 (a)(1)	Y
	(2) contain chemicals expected to cause carcinogenic, mutagenic, tetragenic, or otherwise harmful effects to human health?	No Fact Sheet Section 3.3.6		Y

Criteria	Description	Resources	Regulation	Mixing Zone Approved Y/N
	If yes, mixing zone prohibited.			
	(3) Create a public health hazard through encroachment on water supply or through contact recreation? **If yes, mixing zone prohibited.**	No Fact Sheet Section 3.3.6	18 AAC 70.250(a)(1)(C)	Y
	(4) meet human health and aquatic life quality criteria at the boundary of the mixing zone? **If no, mixing zone prohibited.**	Yes Fact Sheet Section 3.3.6	18 AAC 70.255 (b),(c)	Y
	(5) occur in a location where the Department determines that a public health hazard reasonably could be expected? **If yes, mixing zone prohibited.**	No Fact Sheet Section 3.3.6	18 AAC 70.255(e)(3)(B)	Y
Aquatic Life	Does the mixing zone…			
	(1) create a significant adverse effect to anadromous, resident, or shellfish spawning or rearing? **If yes, mixing zone prohibited.**	No Fact Sheet Section 3.3.7	18 AAC 70.250(a)(2)(A-C)	Y
	(2) form a barrier to migratory species? **If yes, mixing zone prohibited.**	No Fact Sheet Section 3.3.7		Y
	(3) fail to provide a zone of passage? **If yes, mixing zone prohibited.**	No Fact Sheet Section 3.3.7		Y
	(4) result in undesirable or nuisance aquatic life?	No Fact Sheet Section 3.3.7	18 AAC 70.250(b)(1)	Y

Criteria	Description	Resources	Regulation	Mixing Zone Approved Y/N
	If yes, mixing zone prohibited.			
	(5) result in permanent or irreparable displacement of indigenous organisms? **If yes, mixing zone prohibited.**	No Fact Sheet Section 3.3.7	18 AAC 70.255(g)(1)	Y
	(6) result in a reduction in fish or shellfish population levels? **If yes, mixing zone prohibited.**	No Fact Sheet Section 3.3.7	18 AAC 70.255(g)(2)	Y
	(7) prevent lethality to passing organisms by reducing the size of the acute zone? **If yes, mixing zone prohibited.**	No Fact Sheet Section 3.3.7	18 AAC 70.255(b)(1)	Y
	(8) cause a toxic effect in the water column, sediments, or biota outside the boundaries of the mixing zone? **If yes, mixing zone prohibited.**	No Fact Sheet Section 3.3.7	18 AAC 70.255(b)(2)	Y
Endangered Species	Are there threatened or endangered (T/E species) at the location of the mixing zone?If yes, are there likely to be adverse effects to T/E species based on comments received from United States Fish & Wildlife Service or National Oceanic & Atmospheric Administration. If yes, will conservation measures be included in the permit to avoid adverse effects? **If yes, explain conservation measures in Fact Sheet. If no, mixing zone prohibited.**	Fact Sheet Sections 3.3.8 and Section 8.0	Program Description, 6.4.1 #5 18 AAC 70.250(a)(2)(D)	Y